

Keeping Tabs on Landscape Changes

Eighty years can be time enough for many changes in a landscape. Or eight decades may be such a short time that there are no discernible changes at all. But how can you tell? How do you track vegetation changes over a period of time that is longer than many lives, let alone most careers?

Rangeland scientists Keith D. Klement and Rod Heitschmidt were able to chronicle 80 years of shifts in vegetation on the Northern Great Plains in a recent ARS publication. They used photographs taken between 1908 and 1937 and reshot about 40 years later. Then, they took a third set of photos of the same locations, giving them a second 40-year interval.

Forty-two sites in Montana, Nebraska, North Dakota, South Dakota, and Wyoming were documented for *Eighty Years of Vegetation and Landscape Changes in the Northern Great Plains. A Photographic Record*. Klement and Heitschmidt, who are with ARS' Fort Keogh Livestock and Range Research Laboratory in Miles City, Montana, planned the publication to give researchers, land managers, naturalists, policymakers, and the general public a way to see even subtle alterations in the Northern Plains over time.

"This series of photographs is important because it's very hard to be completely sure of vegetation and landscape changes, even in places you know well yourself," explains Heitschmidt. "You think you'll remember how a landscape looks. But when you come back a few years later, do you really know how much change has taken place, unless something dramatic has happened?" Written descriptions and plant counts never have the same impact and independent witness that photographs do, he adds.

Homer Shantz, a noted botanist and former president of the University of Arizona, took the earliest set of photographs between July 14, 1908, and September 1, 1937. Shantz began rephotographing the original sites on June 13, 1958, but died later that year. His graduate student, Walter S. Phillips,

completed the repeat photography, shooting until 1960. The third set of black-and-white photographs was commissioned by ARS in 1998. Klement revisited the sites in 1999 to confirm changes in vegetation and landscape.

When they first compared the pictures, Klement and Heitschmidt were most impressed by how few changes in the types of vegetation there had really been, despite the fact that the Northern Great Plains has been ranched extensively during the past 80 years.

"It wasn't that the land looked better than I expected, because 'better' is a value judgment. We simply examined the photographs for changes in the types and density of plants. That's objective science. And we just didn't see a lot of major alterations," Heitschmidt says.

He points to this as a sign of how stable the Northern Great Plains vegetation complex really is. The plains evolved with tough, perennial grasses to withstand drought and grazing. "Grasses don't care whether the grazing is done by bison or cows, as long as the perennial grasses are left in place and the area isn't overgrazed," he says.

Most marked among the changes the researchers did find were the increased density of ponderosa pine trees on mountains and hillsides and the thickening of sagebrush in valleys and foothills.

"Wildfires have been keeping the pines in check for centuries. But fires have been controlled or eliminated in the last 80 years," Klement says. "Without periodic fires, smaller trees are not controlled. So the natural ecology of larger, older, and less dense ponderosa pine forest with a herbaceous understory has given way to numerous smaller trees, with a barren or pine-needle-filled understory. At many sites, we see a dense forest emerging in place of a historically open type of forest."

The lack of fires has had a similar effect on sagebrush in the drier lowland areas, that is, an increase in the amount of land covered by sagebrush and the density of each patch.

WALTER PHILLIPS (K10072-2)

CHARLES KAY (K10072-3)

Top to bottom: Photos taken in 1924, 1959, and 1998 at a range about 1.3 miles west-southwest of Fryburg, North Dakota. Since 1924, uplands and hillsides once dominated with grasses now host several shrub and tree species.

Klement also noticed more expansive areas of crested wheatgrass and yellow sweetclover, with the bright yellow flowers of the clover casting color over some grassy stretches. These nonnative species were once planted along roadsides and ditches and introduced into pastures and hayfields. In some cases they are still being planted today. In several areas, they have escaped the planting sites and have begun to spread and outcompete native plants.

Other actions by people have had more subtle effects on the landscape. Fences and roads have created microclimates—new ecological niches. Birds sit on fences and drop seeds where they might not normally fall. Road grading creates raised areas that hold water, which then become hospitable to different plants.

In some photo series, the land can be seen circling back to an earlier state. Photos from 40 years ago show a common practice of clearing vegetation and beaver dams from streams to help the water run more freely for irrigation. “But we’ve learned about the importance and the value of riparian zones now, and in the most recent set of photos, you can see where people have let the plants grow back along the creek banks,” Klement says.

Since the book’s publication, Klement has gotten a steady stream of requests for copies. “All sorts of people have been interested—extension agents, the Bureau of Land Management, universities, historical societies, the Natural Resources Conservation Service, and local ranchers, to name a few,” he says. “State agencies, like the Nebraska Game and Parks Commission, and high school teachers, like one from Maize, Kansas, who plans to use the book as part of his curriculum, are also putting this land record to use.”

Even a woodland ecology scientist from Rockhampton, Australia, plans to compare it to similar work in her country.

“What we have now are preserved reference points that let us clearly see changes that are not apparent within a short span of time,” Klement emphasized. “Hopefully, someone will do this again in another 40 years.”

The publication is available online at <http://www.ars.usda.gov/is/np/eightyyears/eightyyearsintro.htm>.—**By J. Kim Kaplan, ARS.**

This research is part of Rangeland, Pasture, and Forages, an ARS National Program (#205) described on the World Wide Web at <http://www.nps.ars.usda.gov>.

Rod Heitschmidt and Keith Klement are with the USDA-ARS Fort Keogh Livestock and Range Research Laboratory, 243 Fort Keogh Road, Miles City, MT 59301-9202; phone (406) 232-8200, fax (406) 232-8209, e-mail rod@larl.ars.usda.gov, keith@larl.ars.usda.gov. ♦

HOMER SHANTZ (K10072-4)



WALTER PHILLIPS (K10072-5)



CHARLES KAY (K10072-6)



Top to bottom: Photos taken in 1917, 1959, and 1998 at a range in Lewistown, Montana. The cars in the photos change with the era, but each car is positioned next to the same fence post. Between the times of the first two photos, the road was moved back about 100 yards. When comparing the three photos, note the increased density and cover of ponderosa pine on the Judith Mountains in the background.